How to Use Science Probes

Research has established that it is important to identify students' misconceptions about natural phenomena and scientific concepts and use the information about students' thinking to design instruction that will facilitate their learning in science. Using the Science Probes in this book will help you achieve this result.

Science Probes are valuable assessment tools before and throughout instruction. Probes are designed to identify common misconceptions, as well as enhance metacognition for students by making them more aware of their existing ideas. Probes can be used before teaching a chapter to make you aware of concepts that may be stumbling blocks for students and to initiate student thinking and discussion about the concepts they will study. Probes also can be used to monitor student learning throughout the course of instruction to determine if students have corrected their understandings of natural phenomena and scientific concepts, and to assess their increasing grasp of the topics. But remember—in order for Science Probes to be considered formative assessments, it is not enough to merely find out what students are thinking. You must use the students' responses to inform instructional decisions.
Six students looked at a barometer, a weather device that measures air pressure. They had different ideas about air pressure. This is what they thought:

Kimberly: I think air has to be moving to create air pressure.
Glenn: Air pressure is a downward force.
Rae: The higher in the atmosphere, the greater the air pressure.
Jeff: Air pressure is the same in all directions.
Oliver: Air pressure increases as the number of air particles increases.
Cameron: Warm air masses have higher pressure than cool air masses.
Jay: When air pressure decreases, it might rain or snow.

Circle the names of the students you agree with and describe why you agree. Describe your ideas about air pressure.
Teacher Notes

The best answer is Jeff, Oliver, and Jay: Air pressure is the same in all directions; air pressure increases when the number of air particles increases; and when air pressure decreases, it might rain or snow.

The big idea is that weather depends on conditions in the atmosphere. One of these conditions is air pressure. Students who choose Kimberly may have a common misconception that air has to be moving in order to exert pressure. This idea comes from feeling the effect of moving air, like wind. Students who choose Glenn commonly believe that air pushes down rather than air acts like a force in all directions. Students who choose Rae may believe that the higher you go, the more air there is, thus, the more weight pushing down. Students who choose Cameron may believe this because they experienced warm, humid air that gave them the feeling that warm air is “heavy.”

Students’ answer choices and explanations will alert you to the need to make sure instruction builds a bridge between the students’ initial ideas about air pressure and the scientific ideas about air pressure that contribute to an understanding of weather as described in the text and experienced through the student activities.